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ABSTRACT

Intended to foster greater understanding of employment projections available from the Bureau of Labor Statistics (BLS), this paper describes their development, their limitations, their use, and publication details. The methods used to develop BLS occupational employment projections are first described: projection of the labor force based on population projections by age, sex, and race; projections on the state of the general economy and on industry employment; and use of an industry-occupational matrix to convert industry employment figures that show the proportion of total employment in each industry by occupation. Assumptions upon which the data are based are discussed, and these factors that cause imprecise projections are cited: imperfect statistics, business cycles, political and social events, analytical judgments, and geographical differences. Uses of projections information by counselors, educators, and others who help people choose a field of work are considered as well as uses by national, state, and local officials who plan education and training programs. Information is provided about the format, purpose, and frequency of the BLS publications that are sources of occupational projections data. A recommendations section urges vocational educators to use and report their satisfaction with occupational projections data in program planning. (YLB)

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Information Series No. 252

NATIONAL OCCUPATIONAL PROJECTIONS FOR VOC ED PLANNING

written by

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FOREWORD

Efforts to establish greater cooperation between the users and producers of occupational projections have resulted in the data being used to a greater extent. However, even greater usage needs to occur if vocational educators are to be fully informed when they make decisions related to program planning. *National Occupational Projections For Voc Ed Planning* is intended to foster greater understanding of employment projections by describing their development, their limitations, their use, and publication details.

This paper is one of ten interpretive papers produced during the fifth year of the National Center's knowledge transformation program. The review and synthesis in each topic area is intended to communicate knowledge and suggest applications. This review will be most useful for persons who are yet unfamiliar with the type and breadth of occupational projections data available from the Bureau of Labor Statistics.

The profession is indebted to Neal H. Rosenthal and Michael Pilot for their scholarship in preparing this paper. Rosenthal is Chief of the Division of Occupational Outlook in the Bureau of Labor Statistics; Pilot is Program Manager of Occupation Outlook Studies of the Division of Occupational Outlook. Through their critical review of the manuscript, Erma Keyes, former director of Pennsylvania's Vocational Education Information Network; Dr. David Stevens, University of Missouri-Columbia; Dr. Wynette Barnard, University of Illinois; Dr. James Pershing, Indiana University; and Dr. Harold Starr and Dr. Arthur Lee of the National Center for Research in Vocational Education contributed to the development of the paper. Staff on the project included Alta G. Moser, Dr. Ann Nunez, Dr. Judith Samuelson, Joan Blank, and Dr. Jay Smink. Ruth Nunley typed the manuscript, Janet Ray served as word processor operator, and editorial assistance was provided by Sharon Fain.

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EXECUTIVE SUMMARY

Occupational employment projections are just one part of the Bureau of Labor Statistics' (BLS) comprehensive program for planning future employment and training needs. The initial step in creating these projections is to develop labor force projections based on population projections by age, sex, and race as prepared by the Bureau of the Census. Added to this are projections on the state of the general economy and on industry employment. Finally, an industry-occupation matrix is used to convert industry employment figures into occupational employment figures that show the proportion of total employment in each industry by occupation.

These projections are tied to specific assumptions about the characteristics and general direction of the economy, and specifically reflect both the projected output of goods and services by industry and the projected output per worker by industry (productivity). The projections are further based on the premise that workers with specific skills will be required to produce goods and services, and that employers will seek to employ such workers.

The reader is cautioned, however, that there are many reasons that actual employment in a "target" or projection year will differ from the projected employment. Some of these reasons include improved technology and production methods not foreseen at the time of projections, fluctuations in demand conditions, a recessionary economy, variance in calculated productivity levels, and fluctuating industry staffing patterns. Thus it is unlikely that there will be identical correspondence between projected and actual employment. These discrepencies, though somewhat limiting, do not render projections ineffective for identifying trends in constructing the future employment picture. To be fully effective, however, occupational projections generated at the national level must be used with related data from state and local levels to form a feasible picture of prospective supply-demand conditions. Such projections can provide information for adjusting programs so that individuals will be trained in occupations that offer favorable job opportunities. Projections information is for the use of counselors, educators, and others who help people choose a field of work, as well as national, state, and local officials who plan education and training programs.

BLS publications identified as sources of occupational projections information are *Occupational Outlook Handbook*, *Occupational Projections and Training Data*, *Monthly Labor Review*, *National Industry-Occupation Employment Matrix*, and the *Occupational Outlook Quarterly*. Vocational education leaders are urged to use and report their satisfaction with occupational projections data in program planning.

INTRODUCTION

The basic intent of vocational education programs always has been to prepare students for jobs that will be available in the labor market. Works expressing this intent date back to the Smith-Hughes Act of 1917 that legislated the first federal support for vocational education. In the mid-1970s, however, a General Accounting Office report criticized the vocational education community for ignoring occupational projections, which identify future job growth and opportunities, in planning vocational education programs (Controller General of the U.S. 1974). Since that time, considerable activity was focused on establishing a cooperative relationship between producers of occupational projections and vocational education officials. An important step in this direction was the establishment of the National Occupational Information Coordinating Committee (NOICC) and its related State Occupation Information Coordinating Committee (SOICC) network as defined in the Education Amendments of 1976 [P.L. 94-482, Section 161 (b) (1)]. It is important to note that Congress, by the creation of these organizations, reiterated its intent that vocational education program planners give attention to the future labor market.

Numerous factors have been identified as contributors to the limited use of occupational projections in vocational education planning (Starr, Merz, and Zahniser 1982; Goldstein 1980). Among those frequently cited is vocational educators' apparent lack of understanding about available projections data. Understanding of information precedes its adequate usage. Therefore, the primary purpose of this paper is to foster vocational educators' understanding of occupational projections as they relate to program planning. For over three decades, occupational projections developed by the Bureau of Labor Statistics (BLS) have been used in vocational guidance. *The Occupational Outlook Handbook*, for example, formats projections as a tool for career guidance and has widespread use. However, the same BLS data, formated for use in vocational education planning, appears to be less extensively used.

The major objective of the Occupation Outlook Studies program is to provide information on future employment opportunities by occupation. The information generated through this program is to be used by counselors, educators, and others who help young people choose a field of work, as well as by national, state, and local officials who plan education and training programs. Analyses of occupations include information on the nature of work; employment, education, and training requirements; the job outlook ten years in the future; earnings; and opportunities in related occupations.

This paper briefly explains the methods used to develop the BLS projections, their characteristics, and how they differ from projections developed by others. It further suggests how BLS data on projections should be interpreted for use in vocational education planning and reports where, when, and in what format the data are published. Since projections by their nature are imprecise, their inadequacies and limitations are identified to caution users about blind reliance on these data. Also presented are some recommendations for improving the use of occupational projections in vocational program planning. The basic premise underlying these recommendations is that projections will be used more frequently with better results as vocational educators acquire more meaningful understanding of the data.

METHODS USED TO DEVELOP BLS EMPLOYMENT PROJECTIONS

Occupational employment projections comprise one segment of a comprehensive view of the nation's future economy as developed by the Bureau of Labor Statistics. They are prepared as part of a series of reports that integrates projections of the labor force, gross national product (GNP), industry output and productivity, and employment by industry and occupation. A new series is produced every other year.

A BLS projections series is tied to a specific set of assumptions concerning the basic structure of the economy, the world political situation, and the general direction of key factors affecting the economy (e.g., government fiscal policy, price levels, and productivity trends). Current bureau practice is to develop alternative projection scenarios that reflect different sets of assumptions. Three scenarios that are labeled low-trend, high-trend I, and high-trend II were prepared as part of the most recent bureau projection series.

Some general assumptions are made for all alternative scenarios. For example, all scenarios in the recent projections assumed that—

- the institutional framework of the economy will not change radically; and
- no major event, such as widespread or long lasting energy shortages or war, will significantly alter the industrial structure of the economy or alter the rate of economic growth.

Other assumptions about general economic and demographic factors that affect the rate of economic growth differentiate the alternative scenarios. For example, in the recent projections, the low-trend scenario assumed continued high inflation, low productivity growth, and moderate expansion of real production. The high-trend I scenario assumed marked improvements in both inflation and productivity, greater labor force growth, and higher real production. The high-trend II version assumed labor force growth consistent with that in the low-trend scenario, but assumed greater gains in productivity and less inflation than that in the high-trend I alternative (Bureau of Labor Statistics 1982b).

Labor Force

The initial step in projections methodology is to project labor force based on the population projections by age, sex, and race prepared by the Bureau of the Census. Population projections are based on trends in birth rates, death rates, and net migration. The greatest uncertainty in these projections is the birth rate. Therefore, the Bureau of the Census prepares several projection series, each having a different birth rate assumption. The BLS generally uses the series that most closely approximates the current birth rate trend. (The birth rate assumption, however, has little bearing on the number of people of working age within the time frame of the BLS projection. Since the BLS target year is generally ten to fifteen years from the base period and an individual must be sixteen years of age to be counted in the labor force, all persons who

will be of working age during the projection period are already born. Consequently, even though trends in birth rates are difficult to predict, the population projections of persons of working age are very accurate.)

The BLS projects labor force participation rates—the proportion of a specific group in the population working or looking for work—for fifty-four separate age, sex, and race groups. These projections are developed by analyzing past trends in these rates from data provided by the Current Population Survey (CPS) and the factors likely to affect these trends over the projection period (Bureau of Labor Statistics, December 1982). Factors considered include changes in Social Security laws and retirement patterns. Participation rates that change most rapidly, for instance those for prime working age females, are the most difficult to project and are most subject to error.

Projected labor force participation rates for each age, sex, and race group are then multiplied by the population projection for that group. The total number of persons participating in the labor force is obtained by summing the groups.

Economic and Industry Employment

To develop economic and industry employment projections, a system of models is used (Bureau of Labor Statistics 1982a). The first step in this procedure is to use a macroeconomic model to project the gross national product (GNP) and its major components, such as consumer expenditures, investments, government expenditures, and net exports. To use this macroeconomic model, assumptions must be specified concerning such factors as demographic trends, the unemployment rate, inflation, government tax and expenditure policies, and productivity trends.

This model generates projections of growth in GNP consistent with income flows. It also provides estimates of growth in the major sectors of the economy and control totals for projected industry purchases. These control totals are used in submodels to distribute aggregate demand to detailed categories of demand. For example, personal consumption expenditures for nondurable goods, a major category of demand, are distributed to various product groups such as food purchased for use at home, shoes, and household furniture. Similarly, investment in producers' durable equipment is distributed among industries that manufacture farm machinery, trucks, mining machinery, office equipment, and computers.

The model then distributes the projected demand in each sector to specific purchases of goods and services produced by 156 different industry sectors. An input-output model is used in this process to estimate the purchases each industry must make from other industries to support its own production. For example, the automobile manufacturing industry purchases steel, rubber, aluminum, plastics, and so on, to produce automobiles. These industries must, in turn, purchase input goods and services to produce saleable inputs for the automotive industry. This process is similar for all other goods and services produced in the economy. This stage of the projections procedures generates output estimates for all final and intermediate demand for each of the 156 industry sectors.

Projected output by industry is converted into estimates of industry employment through a labor demand model. This model projects productivity (output per worker) by industry and then uses these productivity projections to convert projected output into projected employment.

Occupational Employment

An industry-occupation matrix is used for converting industry employment to occupational employment (Bureau of Labor Statistics 1982c). This matrix shows the proportion of total employment in each industry accounted for by each occupation. These ratios, referred to as industry staffing patterns, are multiplied by total industry employment to derive estimates of occupational employment. In each projections series, matrices are developed both for the current or base year and the target year of the projections.

Since the mid-1960s, the bureau has used an industry-occupation matrix to develop occupational projections. For the latest set of projections, however, which have a base year of 1980 and a target year of 1990, the detailed steps in the procedure were somewhat different because the primary data base used to develop current industry staffing patterns in the matrix changed from the decennial census to information from the Occupational Employment Statistics (OES) survey (Bureau of Labor Statistics, December 1982). As a result of this change, the size of the matrix increased from 377 occupations and 201 industries to 1,678 detailed occupations and 378 industries. The most significant factor in shifting the matrix base from census data to the OES statistics was the greater reliability of the occupational employment data by industry in the OES surveys.

Because the basic BLS model used to develop industry employment projections generates data for only 156 industries, the first step in developing the occupational projections is to correlate the projections for 156 industries with the 378 industries for which staffing patterns are available. A series of equations tying economic variables to industry employment is used to make this correlation for each industry.

The industry staffing patterns used in the matrix cover only wage and salary workers; they do not cover self-employed and unpaid family workers. (Current and projected estimates of self-employed and unpaid family workers by occupation are developed for the economy as a whole; they are not broken down by industry. Historical data from the CPS are still used in the analyses underlying these projections.) Estimates of current employment for wage and salary jobs, roughly 95 percent of all jobs, are developed through a current year matrix. To develop these estimates, staffing patterns from the most recent OES survey in each industry were benchmarked or multiplied by the estimates of employment for that industry. Such industry estimates are obtained from the BLS Current Employment Statistics establishment survey.

The same procedure is used to develop the projected occupational employment totals, except that the staffing patterns in the current matrix are projected to the target year. Projections of staffing patterns for each industry are based on an analysis of available data on historical trends in these patterns and studies of the factors that have affected past trends and are expected to affect future trends. Factors considered include likely changes in the product mix of industries, changes in production methods, changes in the average size of establishments by industry, and other technological changes affecting utilization patterns of workers in specific occupations. The resulting staffing pattern projections are applied to the projected industry employment totals, summed across industries, and added to projected totals of self-employed and unpaid family workers to get estimates of total projected employment by occupation.

It is important to note that each and every step in the entire projections procedure just described—from the development of projected labor force participation rates to projected industry staffing patterns—is reviewed in detail. Because of the interrelationship of data from one stage to the next, a process of going back and reviewing previous steps is necessary to ensure there are no analytical inconsistencies. The entire process of developing a set of projections from basic data development to publication takes roughly one year.

MEANING OF THE DATA

As indicated previously, BLS projections of occupational employment are based on and are consistent with a set of economic projections. They represent estimates of the amount of employment required to produce the projected demand for goods and services in the target year. They are tied to specific assumptions about the characteristics and general direction of the economy and reflect specific levels of projected output of goods and services by industry and output per worker by industry.

Occupational Changes

It is very important to note that the productivity projections implicitly assume changes in technology that affect the manner in which goods and services are produced. Changes are incorporated into the input-output model to reflect technological change and other factors. Similar changes are implicit in the projected industry staffing patterns in the industry-occupation matrix used to translate industry employment projections into occupational projections. Wherever possible, however, analyses of the staffing patterns reflect explicit judgments about the factors that are expected to result in change. For example, in the 1980-1990 projections, the proportion of total employment in most industries depending on computer-related occupations was projected to increase as a result of a judgment that the use of computer technology would increase significantly. Judgments that reflect an assessment of the functions and related occupations that will experience decreases in growth as a result of the increasing use of computer technology were also made. In accounting firms, this may be estimated to be a reduction in the relative need for accounting clerks and bookkeeping workers as the computer makes existing workers more efficient. In wholesale trade, this may be reflected in a decline in the relative importance of inventory control clerks whose functions are eliminated in part by computer-controlled inventory systems.

The specific factors considered in the analyses of staffing patterns are tied to the demand for workers in specific occupations. Staffing patterns are not adjusted to reflect a potential undersupply or oversupply of workers. This concept is extremely important in interpreting the projections. The projections of staffing patterns assume that, for a given occupation, factors such as the greater availability of training or relatively less expensive training costs, changes in relative wage rates, or changes in the perceived desirability of work in that occupation will not alter the projected demand for workers.

The projections are based on the premise that workers with specific skills will be required to produce goods and services and that employers will seek to employ workers having those skills. It is implied, therefore, that employers will find it too costly and inefficient to change production methods in response to a shortage of workers during the projection period. Furthermore, this premise assumes that, when worker shortages arise, employers will hire workers with different educational or skill mixes than they would ordinarily prefer.

In the long run, of course, employers do change technology and production methods. Such changes are implicitly accounted for in the projections by the changes in staffing patterns from the base year to the projected year. For example, decisions to change production methods based on changes in staffing patterns implicitly reflect cost analyses on the part of employers that take into account supply-demand conditions, wage rates, and a variety of other factors. Thus employers who decide to use more efficient machine tools in their production process (e.g., numerical controlled machine tools) implicitly or explicitly consider current shortages of machinists in their decision.

It is also recognized that future supply-demand conditions will in fact have a significant bearing on actual employment in the target year. For example, when workers who have very specific skills, such as engineers, tool-and-die-makers, or plumbers, are in short supply because of reduction in real wages or a decline in training, actual employment will be lower than the projected level and employers will presumably have vacancies. This concept is very important in understanding the intended uses of the BLS projections in vocational guidance and educational planning. This is discussed in detail in the next section of this paper.

There are also many other reasons that actual employment in the target year will differ from projected employment. Actual employment will differ from projected employment when the target year happens to fall within a downturn in a business cycle. The bureau's projections always assume relatively full employment. If the economy is in the trough of a recession in the target year, employment in general will be lower than projected. However, if the unemployment rate is 9 percent during the recession and a 5 percent rate was assumed, it does not mean that employment in every occupation will be 4 percent lower than projected. Some occupations are more severly affected than others; for example, the automobile industry was hit very hard during the 1981-1982 recession.

Of course, errors in the projections of output, productivity, and staffing patterns all have a bearing on differences between actual and projected employment. Because of the multitude of judgments made and the variable data used in developing projections, it is unlikely that projected and actual employment will be identical. It is hoped, however, that the general trends described by the projections will approximate the characteristics of demand in the target year (Fullerton 1982; Carey and Kasunic 1982).

Through the alternative projections developed by the bureau, some of the possible differences in employment trends for occupations can be anticipated. The trends are similar because the general assumptions are similar in all the alternative scenarios. The wider variances occur because of differences in specific assumptions related to demand. As a matter of policy, the bureau has never developed a scenario that assumed a recession in the target year. For the primary intended uses of the projections—educational planning and career guidance—the bureau does not support a focus on shorter-term, or recession-type, phenomena.

To understand the meaning of the bureau's projections it is also important to understand how they differ from projections developed under different concepts. For example, projections of employment in health care occupations can be projected on the basis of a "goals" concept. In this procedure, a goal is generally set based on a ratio of workers in that occupation to the population. For example, a desired ratio of physicians to population might be established as 1 to 100. Such a ratio may be desirable from a standpoint of health care standards, but from an economic perspective it may not be practical. Such goal-oriented projections should generally not be used in career guidance or education planning. If training is conducted in light of unachievable goals, there could be many people trained and looking for work in an occupation where jobs do not exist.

Job Openings

Because they are concerned only with the changes in employment, projections of occupational growth tell only part of the job opportunities story. Job openings also occur when workers die, retire, transfer to other occupations, or leave the labor force temporarily. For most occupations, the number of job openings stemming from replacement needs are much greater than those generated by employment growth.

From the early 1960s through 1980, the bureau developed estimates of replacement needs due to permanent labor force separation (i.e., deaths and retirements). These estimates were based on working life tables for the entire labor force. However, for specific occupations, these rates only reflected differences in the age and sex composition of an occupation; they did not take differences in occupational retirement patterns into account. In 1980, the bureau developed a new data base that provides occupationally specific information on replacement needs for all causes of separation except death (Bureau of Labor Statistics 1980). These data show that, on the average, replacement needs for all causes of separation are three times those caused by permanent labor force separations. However, the data base has several analytical limitations that prevent its immediate adoption into the bureau's published statistics on job openings. Of great significance are the differences in the systems used to classify occupations in the CPS (the source of the new replacement needs data) and in the OES surveys (the basic source of data on occupational employment used in the projections). For example, CPS data on machinists are not comparable to OES data on machinists; the CPS occupational classification includes eight related occupations that are classified separately in the OES, only one of which is titled machinist.

The new data also provide information on the characteristics of workers who entered specific occupations, including the proportion of entrants who have transferred from other occupations and of new entrants to the labor force. However, the data do not permit the clear identification of entrants who have completed training programs. This is true primarily because students working part-time while attending such programs are counted as occupational transfers in the statistics.

Considerable analyses have been done on this new data base, but more research is needed before data on all occupations can be published with confidence. Data for fifty-five occupations, however, are presented in the 1982 edition of *Occupational Projections and Training Data*. This publication also provides a detailed discussion on the development of these data (Bureau of Labor Statistics 1982e). Information on automobile mechanics and secretaries that appear in this publication is presented in the appendix to illustrate the kind of insights into employment patterns that the new data base provides. Vocational education is a significant source for supplying workers to both occupations.

LIMITATIONS OF OCCUPATIONAL PROJECTIONS

Occupational projections are imprecise due to imperfections in the information used to develop the projections, the vagarious nature of political and social factors that affect the economy over time, and the inability of individuals to make perfect analytical judgments about the interaction of the many factors that affect employment. In addition, geographic diversities often influence local employment trends that are significantly different from national trends.

Imperfect Statistics

Trends and factors which affect them are critical information for projections development. Unfortunately, in the preparation of trends and their analysis, product reliability is diminished by problematic source data and its manipulation. Among the various surveys that supply needed data are differences in basic concepts and definitions (i.e., data collected on occupational employment in the CPS have characteristics that differ from employment data in the OES surveys). Trend analysis of survey data from many statistical series will identify factors which affect trends. But it must be noted that all survey data series have variances caused by sampling and response errors that can distort trends and their analysis. These discrepancies, though somewhat limiting, do not render projections ineffective for identifying trends in constructing the future employment picture.

Business Cycles

The economy is characterized by cycles in business activity and these cycles affect the many segments of the economy differently. Furthermore, the timing of these cycles cannot be accurately predicted. Thus the target year of given occupational projections can easily fall during the downturn of a business cycle. For example, BLS projections were made for 1975 and 1980 which were both recession years.

Political and Social Events

Although it is generally assumed that no political or social event will take place to change the basic structure of the economy during the projection period, major events of this nature do occur. For example, there have been wars and other major political events such as oil embargoes during projection periods. Clearly events that have a major effect on employment cannot be predicted ten years in advance. Social events, although generally minor in overall impact, can also significantly affect employment in some occupations. For example, the trend toward long hair for men in the late 1960s and early 1970s was not foreseen in the early 1960s. As a result, the projected 1975 employment for barbers was much higher than actual employment.

Analytical Judgments

In developing occupational projections, many judgments are made concerning the multitude of factors affecting employment. For example, the use of robots in manufacturing industries is expected to have a major impact on employment during the 1980s. In developing the 1990 projections, judgments were made about the infusion rate of this technology into different industries and how it might affect employment in different occupations. Although these assumptions cannot always be quantified explicitly, they are implicit in the projections of staffing patterns for specific industries.

Geographical Differences

The BLS projections are based on the national economy. However, past employment trends for specific industries and occupations have differed by geographic area and, presumably, will continue to do so in the future. To illustrate, the current trend of industries moving from the Northeast to the South has caused employment in these industries to grow in the South and decline in the Northeast. Nationally, an overall growth is reflected as these industries prosper in their new locations, but for the Northeast, a decline is still the end result. Despite the differences between regional and national trends, state and area industry and occupational projections developed by state employment security agencies are generally consistent with national projections developed by BLS. The main reason for this is that procedures followed by state employment security agencies in developing projections utilize national industry projections and national staffing pattern projections for specific industries (Bureau of Labor Statistics 1969).

USE OF PROJECTIONS IN VOCATIONAL EDUCATION PLANNING

Occupational projections and supply-demand analyses are among many factors to be considered by education officials in planning programs. Other factors that should be and are considered include program costs; availability of teachers, equipment, and facilities; employer hiring and training practices; student interest; student follow-up data; and employer follow-up data. The occupational projections and supply-demand analyses used should include data for the local area, the state, and the nation as a whole. Thus data provided by BLS reflecting national information represent only one of many factors that will enable local education officials to make informed decisions related to program planning.

Local vocational education officals make most decisions with respect to adding, terminating, or modifying their vocational education programs. Their response to a recent survey conducted by the National Center for Research in Vocational Education confirmed a prevailing attitude toward use of national data for local planning. According to Franchak (1983, p. 17): "The majority of the respondents indicated that the published data provided by state and national sources did not address their needs, and were considered only because of requirements for state or national planning activities." The implication is, that in planning programs, the needs of local employers supersede the possibility that students may want preparation for employment opportunities beyond the local area. The degree to which that consideration is followed can be debated, however, because a very large proportion of young persons in the labor force move from one geographic area to another over the period of a year. That debate, however, must be resolved by the education community, not by the producers of statistics.

Although the importance of occupational projections relative to other factors in vocational education planning is subject to debate, the premise upon which occupational projections data should be used is very straightforward: knowledge about occupations that are growing and have favorable supply-demand situations can be used to adjust program offerings so individuals can receive training for occupations in which there will be good job opportunities. This is the kind of knowledge about occupations provided by BLS in its national information. Included are data on the relative growth in the number of jobs among occupations. Information on total job openings and supply-demand conditions for the many occupations analyzed in detail by the Occupational Outlook Program is also available. As indicated before, most state employment security agencies produce similar data for state and local areas. Therefore, information in the following paragraphs, even though it focuses on the use of BLS national projections, can be related to the use of state and local area occupational projections in education planning.

The meaning of occupational projections must be considered carefully when projections are used in making decisions about vocational education program offerings. The BLS projections reflect estimates of the demand for workers in specific occupations. If these demand projections are accurate, a balance of supply and demand can be achieved only if supply is adjusted to meet demand.

The Bureau's publications are designed to provide data that lead to an adjustment in supply in two ways. The first is to provide information through career guidance materials to individuals

so they can plan to prepare for occupations with favorable job prospects. The second is to provide statistical information about job prospects to education planners. Vocational education planners, however, must recognize that graduates of training programs in public vocational education are not the only supply of workers. The supply of workers in most occupations is augmented by students who are prepared in private vocational schools, through employer sponsored training, and by on-the-job experiences. Thus public vocational education is only part of the supply picture.

Examination of data on the training and employment potential of cosmetologists illustrates the need to also consider data on private vocational training when planning public vocational programs. In the 1979-1980 academic year, about 25,400 individuals completed public vocational education programs in cosmetology. An additional 66,500 completed programs in private noncollegiate postsecondary schools. When combined, these data total 92,000; the total number of completers was higher than the 77,000 to 90,000 annual average job openings projected by BLS. In addition, many previously trained individuals who are out of the labor force because of family responsibilities seek cosmetologist jobs each year.

The importance of considering occupational mobility in planning is illustrated by data on television and audioservice technicans. In 1980, over half of all job openings in this occupation were filled by persons who transferred from other occupations, most likely from mechanic and repairer or other craft occupations. Thus, of the 17,600 to 19,300 average annual openings projected by BLS, only half are likely to be available to *new* graduates of training programs if the current patterns of entry into this occupation continue. One of the analytical judgments that must be made is whether this pattern is what employers desire or if it occurs when employers are forced to take less qualified workers. This can happen when an insufficient number of individuals complete training programs.

The information presented in the previous paragraphs does not reflect all the information that should be used in planning. It does, however, illustrate the wide variety of labor market information that should be used in addition to occupational projections and data on program completers from public vocational schools. Significant help on the use of such additional labor market information is available to those who seek it. The National Occupational Information Coordinating Committee's *Occupational Information System Handbook* discusses available data and methods of analysis for use in planning (National Occupational Information 1981).

In summary, occupational projections must be used with related data to form a picture of prospective supply-demand conditions. In some occupations the picture may be reasonably sharp. In others, sufficient information may not be available or the picture may be unclear. However, answers do not appear magically with the comparison of a few simple numbers turned out by statistical agencies—analysis is required.

WHERE, WHEN, AND HOW THE DATA ARE PUBLISHED

The following discussion provides information about the format, purpose, and frequency of the publications developed on data projections by the Occupational Outlook Studies program of the bureau. Information includes analyses regarding the nature of the work; employment, education, and training requirements; the job outlook ten years in the future; earnings; and data on related occupations. Table 1 shows the current and forthcoming printing schedule for key publications and statistical releases.

Occupational Outlook Handbook

The *Occupational Outlook Handbook* is the major publication of the Occupational Outlook Studies program. Oriented toward career guidance, the *Handbook* is the most respected and widely used reference source in the field. A recent comprehensive study of occupational information in secondary schools estimated that 92 percent of all secondary schools had at least one copy of the current edition. The report stated "that the [*Handbook*] is the most widely used resource nationally for the greatest variety of purposes and topics" (Chapmen and Katz 1981, p. 84). The U. S. Government Printing Office has sold in excess of 150,000 copies of recent editions.

First issued in 1949 in response to a formal resolution by the National Vocational Guidance Association and with funding from the U. S. Veterans' Administration, the *Handbook* has been published biennially since 1957. Since 1966, each edition has been issued in the spring of even-numbered years. This production cycle coincides with the cycle used by the bureau to develop economic, industry, and occupation projections. Since the job outlook information in each *Handbook* is based on revised projections, only the most current edition should be used.

The 1982-1983 *Handbook* contains comprehensive, nontechnical job information on about 250 occupations across the entire spectrum of white-collar, blue-collar, and service occupations. The information on job outlook is descriptive in nature because of the audience for which it is targeted—high school students. In most cases, the information about job prospects begins with a sentence about the expected change in employment over the projected period. In general, if expansion in an occupation is expected to be as fast as or faster than the average for all occupations, job opportunities should be favorable. Occupations in which employment is likely to grow more slowly than the average, stay about the same, or decline offer generally less favorable job prospects. For those occupations for which information is available on the supply of workers, the job outlook describes prospective employment opportunities and expected demand-supply relationships. Guidelines that govern the use of this descriptive phraseology are included to help the reader interpret the information (Bureau of Labor Statistics 1982d).

TABLE 1

PRINTING SCHEDULE FOR KEY PUBLICATIONS AND STATISTICAL RELEASES

(From Office of Economic Growth and Employment Projections
Bureau of Labor Statistics)

PROJECTION ITEM	PUBLICATION MODE[1]	RELEASE DATE (year/quarter)																			
		Current 1980–1990 series												Forthcoming 1982–1995 series							
		1980				1981				1982				1983				1984			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Labor Force	MLR[2]				x											x					
Economic growth	MLR[2]							x								x					
Industry output and employment	MLR[2]							x								x					
Occupational requirements																					
Preliminary estimates	MLR[3]							x								x					
Final estimates	OOH[4]										x								x		
	OOQ[4]										x								x		
	OPTD[4]												x								x
Total job openings	OPTD[4]												x								x
Industry-occupation matrix																					
Preliminary estimates																					
Summary detail	5							x								x					
Final estimates																					
Summary detail	6								x								x				
Complete detail	Computer tape										x								x		
	Microfiche											x								x	
	Hard copy											x								x	

1. MLR = *Monthly Labor Review;* OOH = *Occupational Outlook Handbook;* OOQ = *Occupational Outlook Quarterly;* OPTD = *Occupational Projections and Training Data.*
2. Usually reprinted with additional statistical detail in a separate bulletin.
3. Includes preliminary matrix estimates for major occupation groups and selected detailed occupations.
4. Includes final matrix estimates for major occupation groups and selected occupations.
5. See footnote[3].
6. See footnote[4].

Occupational Projections and Training Data

This BLS publication presents detailed national statistics on employment, job openings, and education and training completions. It also is a vehicle to report on the results of other job outlook-related research. *Occupational Projections and Training Data*, initiated in 1970, has been published biennially since 1974 and each issue has been released about nine months after the *Handbook*.

The 1982 edition, the sixth edition in the series, discusses the significant changes in the data sources and procedures used by the bureau to develop its 1980-1990 estimates of job openings. It also indicates how the new data differ from, and why they are not comparable with, information presented in previous editions of this bulletin. Furthermore, it explains how the information can be used to assess the degree of competition for jobs. A separate chapter examines the movements into, out of, and between occupations during the one-year period of 1980-1981. Using the newly developed data, the bulletin details the employment patterns and job outlooks for fifty-five occupations.

The number of occupations for which estimates of replacement needs can be developed is limited, in the short run, due to: (1) problems stemming from noncomparability between CPS and OES occupational definitions and (2) the BLS policy of subjecting new data to close scrutiny. Eventually, as the OES and CPS are made more compatible with the 1980 Standard Occupational Classification (SOC) that was the basis for the census occupational classification structure that will be used in the CPS for the remainder of the 1980s, the potential number of occupations for which replacement needs can be estimated should increase significantly.

Like previous editions, the 1982 edition of *Occupational Projections and Training Data* is designed to provide education and training program planners with national data that can be analyzed in conjunction with available state and local supply-demand data. Available data on training completions are presented. However, they are not juxtaposed with the job openings data because these figures should not be considered to be training needs—many of these jobs are filled by transferring workers who have received training previously or informally on other jobs.

Monthly Labor Review

This periodical is a vehicle for the initial release of data from new projections. One article deals with new projections of the labor force by age, sex, and race (Fullerton 1980). These releases draw attention to the possible consequences of the changing structure of the labor force, including the prospects of scarcities of certain kinds of workers. Other articles cover gross national product projections, in total and by major demand and income components, industry output, and employment; and occupational requirements (Kutscher 1981; Saunders 1981; Personick 1981; Carey 1981). This material describes the probable range within which economic growth will most likely occur during the projected period under differing assumptions on fiscal policy, labor force growth productivity, inflation, and full employment; identifies the industries and occupations that are projected to grow fastest, have the largest employment gains, or experience employment declines; and provides some insights on the degree of sensitivity of specific variables on the projections.

The *Monthly Labor Review* is also used to present research findings that are technical in nature. Recent articles that are likely to be of interest to education and training program planners include an evaluation of the 1980 labor force and occupational projections and an examination of the magnitude of a reported shortage of machinists (Fullerton 1982; Carey and Kasunick 1982; Rosenthal 1982).

National Industry-Occupation Employment Matrix

The bureau develops comprehensive data on employment in specific occupations that are cross-classified by industry in the form of a matrix or table. The matrix can be presented in absolute numbers or in ratios to show the proportion of total employment in each industry accounted for by each occupation detailed. The data can also be transposed to show how total employment in an occupation is distributed by industry.

Current- and projected-year matrices are developed on a two-year cycle to coincide with the cycle used by the bureau for developing economic, industry, and occupational projections. Summary data from these matrices are published in the *Occupational Outlook Handbook* and in other bureau publications (see table 1). The 1980-1990 set of matrices includes 1,678 occupations and 378 industries. Because of the size of the matrices, they have not been published. However, data for 689 occupations (with 5,000 or more workers) and 378 industries are available on computer tape[1], hard copy, and microfiche[2].

Occupational Outlook Quarterly

The *Quarterly* publishes current occupational and job outlook information. For example, the article "Comparing Occupations: Four Measures," in the Fall 1982 issue ranked 176 occupations on the basis of size, projected change in employment, unemployment, and earnings. Regular features of the *Quarterly* are "Job Outlook in Brief" and "Job Outlook for College Graduates." The "Job Outlook in Brief" article stems from ongoing projections work and is published in the Spring issue of even-numbered years or as concurrently as possible with the *Handbook*. It presents estimates of current employment, the range of the projected percent change in employment, and a summary of employment prospects for occupations detailed by the Occupation Outlook Studies program. The "Job Outlook for College Graduates"—published in the Summer issue of even-numbered years—analyzes current and prospective supply-demand conditions for persons having four or more years of college.

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1. Available for $65. For details on how to purchase this tape, contact the Division of Occupational Outlook, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20212.

2. Orders for hard copy and microfiche should be sent to National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. *Occupation-Industry Employment, 1980 and Projected 1990 Alternatives* (PB 82-243262) and *Industry-Occupation Employment, 1980 and Projected 1990 Alternatives* (PB 82-243270) are available separately. The cost of microfiche for each set is $40.50. For the cost of printed copies, phone NTIS at (703) 487-4650.

RECOMMENDATIONS

Published reports indicate that national occupational projections have been used minimally in vocational education planning. Most of these reports appeared in the mid-1970s before NOICC was established. Since that time a major effort to foster greater cooperation betweens the users and producers of occupational projections data was initiated. Consequently, occupational projections have been used to a greater extent; but it is unclear what impediments to their use remain (Franchak 1982).

The producers wish to further their credibility with the vocational education community and to increase the usefulness of their data projections. Therefore, they invite the users to respond, in the form of inquiry, suggestions, or criticism, to the following recommendations:

- *Submit to the producers specific changes or additions that would increase the utility of occupational projections for planning vocational education programs.* How adequate are the level of occupational detail, frequency, and timeliness of the projections? Do particular elements or aspects of projections discourage their initial or continued use for program planning? What steps can the BLS, NOICC, and the state producers of projections take to surmount utilization problems?

- *Register positive results from the use of occupational projections in program planning for dissemination with the producers.* Many leaders in the field of vocational education have supported use of occupational projections in speeches and presentations given at numerous meetings and conferences. These remarks should be distributed widely in an appropriate format to reach the large numbers of individuals in state and local education agencies throughout the country who were not in attendance at such gatherings.

- *Share information that demonstrates how occupational projections have been used in planning and their impact on planning decisions.* Numerous materials have been developed that discuss procedures for gathering and analyzing occupational projections and related occupational information for use in vocational education planning. Much of the information has been developed through the efforts of NOICC. However, little has been done that shows the specific results of the use of such information, especially occupational projections. For example, it should be shown that when specific decisions on program expansion or contraction stemming from the use of occupational projections were made by state or local administrators, different decisions would have been made if such data were not available.

- *Establish more effective awareness measures regarding new projections.* U.S. Department of Labor mechanisms for releasing information on new projections should be tied directly to vocational education information networks to reach the largest possible audience of potential users.

Clearly, the development of information that demonstrates the increasing use and value of occupational projections in vocational planning is necessary. Although such information could

be developed by the producer of the data, the information would have much greater value if it were produced and disseminated by the leading users of such data in the vocational education community. The skepticism that exists in this community about the value of projections will not be eliminated unless it is removed by practitioners themselves.

APPENDIX: SELECTED INFORMATION FROM OCCUPATIONAL PROJECTIONS AND TRAINING DATA

Automobile Mechanics

Training

Most people prepare for a career as an automobile mechanic by acquiring experiences in related, lesser skilled occupations such as gasoline station attendant, lubrication worker, or mechanic's helper where they have the opportunity to observe and work with experienced mechanics. They may supplement these experiences through automobile repair courses in high schools, trade and vocational schools, community and junior colleges, and the Job Corps. About 100,000 persons completed education programs in automobile mechanics from these combined sources in 1979-1980. However, not all planned to become automobile mechanics. Some people pursued an interest in automobile mechanics simply as a hobby; others planned to become truck and bus mechanics, automotive body repairers, or automobile repair service estimators. Many training authorities believe apprenticeship provides the most thorough preparation for a career in automobile mechanics. However, fewer than 1,500 persons completed formal registered apprenticeship programs in automobile mechanics in 1979.

Employers of automobile mechanics generally prefer to hire high school graduates with manual dexterity, mechanical aptitude, and thorough knowledge of automotive systems. The ability to perform at least the simpler automobile service and repair tasks quickly, efficiently, and reliably and to understand technical repair manuals, parts catalogs, and service orders is essential. Training acquired in the armed forces is also very useful.

Employment Patterns

Job opportunities for automobile mechanics are expected to be good throughout the 1980s due to the large number of openings that will occur and the absence of rigid entry requirements. Job openings for mechanics are projected to average between 147,000 and 159,000 annually during the 1980s. Employment of mechanics is expected to increase in proportion to the increased number of motor vehicles in operation. Replacement positions, however, are expected to be the main source of jobs, accounting for six out of every seven openings during the decade.

In 1980, 17 percent of all automobile mechanics left their jobs—roughly the same proportion as for other craftsworkers. Of these, 52 percent transferred to other occupations, 26 percent became unemployed, and 22 percent left the labor force. Two-fifths of the mechanics who left the labor force were persons fifty-five and older who presumably retired.

Nearly six out of ten job openings for mechanics in 1980 were filled by persons who were not working the previous year. About 44 percent of these individuals had been unemployed—

SOURCE: Bureau of Labor Statistics 1982e

somewhat less than the proportion for all craftsworkers and for all mechanics and repairers. A higher than average proportion—33 percent—of those not working had been in school the year before, reflecting the attractiveness of automobile mechanic careers to younger workers, and the widespread availability of vocational training in this field. About four out of ten entrants to the occupation in 1980 transferred from other fields of work—about the average for all occupations.

Automobile mechanic jobs generally do not require education beyond high school. Of those who entered the occupation in 1980, 87 percent had a high school education or less. Most of those who got jobs as automobile mechanics, however, did not enter directly from school. Slightly more than half of those who found work as automobile mechanics in 1980 were under twenty-five years of age. In comparison, less than 40 percent of all individuals entering craft jobs were under twenty-five years of age.

TABLE A-1

AUTOMOBILE MECHANICS PROJECTIONS

ASPECT	DATA
Employment, 1980	845,000
Projected employment, 1990	1,050,000 — 1,120,000
Percent change, 1980-1990	24.4 — 32.9
Average annual openings, 1980-1990	146,800 — 158,800
Growth	20,600 — 27,800
Replacement	126,200 — 131,000

Secretaries

Training

High school graduates qualify for most secretarial positions provided they have basic office skills. Secretaries must be proficient in typing and good at spelling, punctuation, grammar, and oral communication. Shorthand is necessary for some positions. Word processing experience is increasingly important and some employers require it. Others, however, provide word processing instruction to newly hired workers.

The skills needed for a secretarial job can be acquired in various ways, although formal training is an asset that may lead to higher paying jobs. Secretarial training ranges from high school vocational education programs (that teach office practices, shorthand, and typing) to one- to two-year programs in secretarial science offered by business schools, vocational-technical institutes, and community colleges.

In 1979-1980, approximately 125,000 individuals completed public vocational education programs in secretarial science; nearly 45,000 completed business school programs; and 33,000 completed community or junior college programs. There is no way of estimating how many of these graduates sought secretarial positions, but it seems likely that many who completed postsecondary programs entered the field. The general office skills that high school programs provide are suitable for many different careers, however.

Employment Patterns

Prospects for secretaries are expected to be good throughout the 1980s in view of the large number of jobs that are projected to be available and the relative ease of entry to the occupation. Openings for secretaries are projected to exceed greatly the number of openings in most other occupations. Between 575,000 and 620,000 jobs are projected to be generated every year during the 1980s because of the relatively rapid expansion in such employment and the need to replace experienced secretaries who leave the profession. Employment of secretaries is projected to grow at a faster than average rate as existing businesses expand and new ones are established. Replacement needs nevertheless are expected to be the primary source of secretarial jobs during the 1980s, accounting for nearly nine out of ten openings.

About 18 percent of all secretaries left the occupation in 1980, compared to 22 percent of all clerical workers who left their jobs. Approximately equal numbers transferred to other occupations or left the labor force altogether. Relatively few secretaries became unemployed. Of those who left the labor force in 1980, nearly 60 percent did so to take up household responsibilities. This was about double the proportion of those who left their jobs for this reason among all occupations.

Two out of five people who took jobs as secretaries during 1980 transferred from another job, many from another clerical position such as typist, receptionist, stenographer, bank teller, bookkeeper, cashier, or statistical clerk. The proportion of job entrants who transferred from another occupation was about average.

Three out of five openings for secretaries were filled by people who had not worked the previous year. Some had been unemployed while others had been in high school, business school, or college. Most, however, had been homemakers. Secretaries are predominantly female, and the occupation is characterized by a pattern of movement from family responsibilities into the labor force and back to the home again. Of those who took jobs as secretaries during 1980, individuals who had not worked the previous year because of household responsibilities outnumbered those who had been in school by roughly three to one. People who took jobs as secretaries in 1980 also were more likely than average to be between twenty-five and fifty-four years of age, a time of life when people are most likely to be responsible for the care and financial support of children. One-third of those entering the occupation were twenty-five to thirty-four years of age and another one-fourth were thirty-five to fifty-four years of age—a larger representation than the average for all occupations.

Individuals with some college education filled nearly two out of five secretarial job openings in 1980. Most of these had attended college for a year or more but had not graduated. The rest of the secretarial openings—more than three out of five—were filled by people who had a high school education or less.

One-fourth of those who took secretarial jobs in 1980 worked part-time. Individuals coming from outside the labor force exhibited more interest in a part-time schedule than those who transferred from another occupation. Women who combine parental and job responsibilities seem to have a preference for a part-time schedule when they first return to work.

TABLE A-2

SECRETARIES PROJECTIONS

ASPECT	DATA
Employment, 1980	2,500,000
Projected employment, 1990	3,200,000 — 3,400,000
Percent change, 1980-1990	28.3 — 37.4
Average annual openings, 1980-1990	575,000 — 618,000
Growth	70,000 — 92,000
Replacement	505,000 — 526,000

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